

# 2012 HIGH VOLTAGE DESIGN WORKSHOP

## *Attend On-site or by Webcast*

A High Voltage design workshop to be conducted by Steven Battel combining lessons of theoretical and practical design concepts with experience and knowledge from many successful Flight Projects.

There is **no cost** for participation. Registration is necessary to send participants Webcast and latest workshop information.



### **2012 High Voltage Design Workshop: Part 2**

**Lecturer: Steve Battel**

Steve Battel is known within the space community for his engineering work related to high voltage systems and precision analog electronics used in space science instrumentation. He is a graduate of the University of Michigan and has 35 years experience as an engineer and manager for NASA and DoD projects. He has developed 58 different high voltage designs for space applications with more than 380 units built and 150 units successfully flown.

President of Battel Engineering since 1990, Steve has also held engineering and management positions at the University of Michigan Space Physics Research Laboratory, Lockheed Palo Alto Research Laboratory, University of California, Berkeley Space Sciences Laboratory and the University of Arizona Lunar and Planetary Laboratory. At UC Berkeley, Steve was the Project Manager for the Extreme Ultraviolet Explorer (EUVE).

Recent hardware projects include flight high voltage and other instrument electronics for the Mars-Phoenix TEGA-MS sensor, the Mars Science Laboratory SAM Instrument and the AIM-CIP camera system. Current hardware development work includes high voltage and low voltage flight electronic systems for the LADEE and MAVEN missions, prototype electronics for the ExoMars MOMA instrument and developmental high voltage systems for space tether, x-ray spectroscopy and miniaturized ion propulsion applications.

Past development projects reach back to Dynamics Explorer and Galileo including the high voltage and low voltage power systems for the MCP cameras used on the SOHO, FUSE, IMAGE, GALEX and HST-COS missions. Steve also developed the low-noise gyroscope power electronics for the GP-B program along with multiple high voltage and lower voltage electronic systems for the Rosetta, XTE, Cassini and Huygens Probe missions.

Electrical Engineering Division  
Code 560, NASA GSFC

**DATES:** OCT 22-23, 2012

**TIME:** 7:30 (PDT) AM Start

**PLACE:** Hameetman Auditorium  
Cahill Physics and Astronomy BLDG  
1216 California Boulevard

Located on the campus of  
**California Institute of Technology**

#### **DAY 1**

- GROUNDWORK AND FEEDBACK
- HIGH POWER KLYSTRON HV DESIGN
- FAST HV MODULATOR DESIGN
- FUSE/HST MCP HV DESIGN
- RECEPTION (5:30 – 7 PM)

#### **DAY 2**

- CHEMIN HV DESIGN
- ALTERNATE CHEMIN HV DESIGN
- MAVEN IUVS HV DESIGN
- USEFUL DESIGN NUGGETS
  - ❖ ION PUMP DESIGN
  - ❖ HIGH PRECISION SUPPLY DESIGN
  - ❖ SILICON DETECTOR HV DESIGN
  - ❖ LOW POWER DESIGN
  - ❖ MARS HV SHIELDED DESIGNS

#### **REGISTRATION:**

PLEASE USE ATTACHED FORM

#### **QUESTIONS:**

CONTACT ERIC YOUNG

[ERIC.YOUNG@NASA.GOV](mailto:ERIC.YOUNG@NASA.GOV)

***No Course registration fee.***

***Catering services will be made available for  
Onsite attendees. Customary donation***



**Power Systems Branch  
Code 563, NASA GSFC**



**Jet Propulsion Laboratory  
California Institute of Technology**



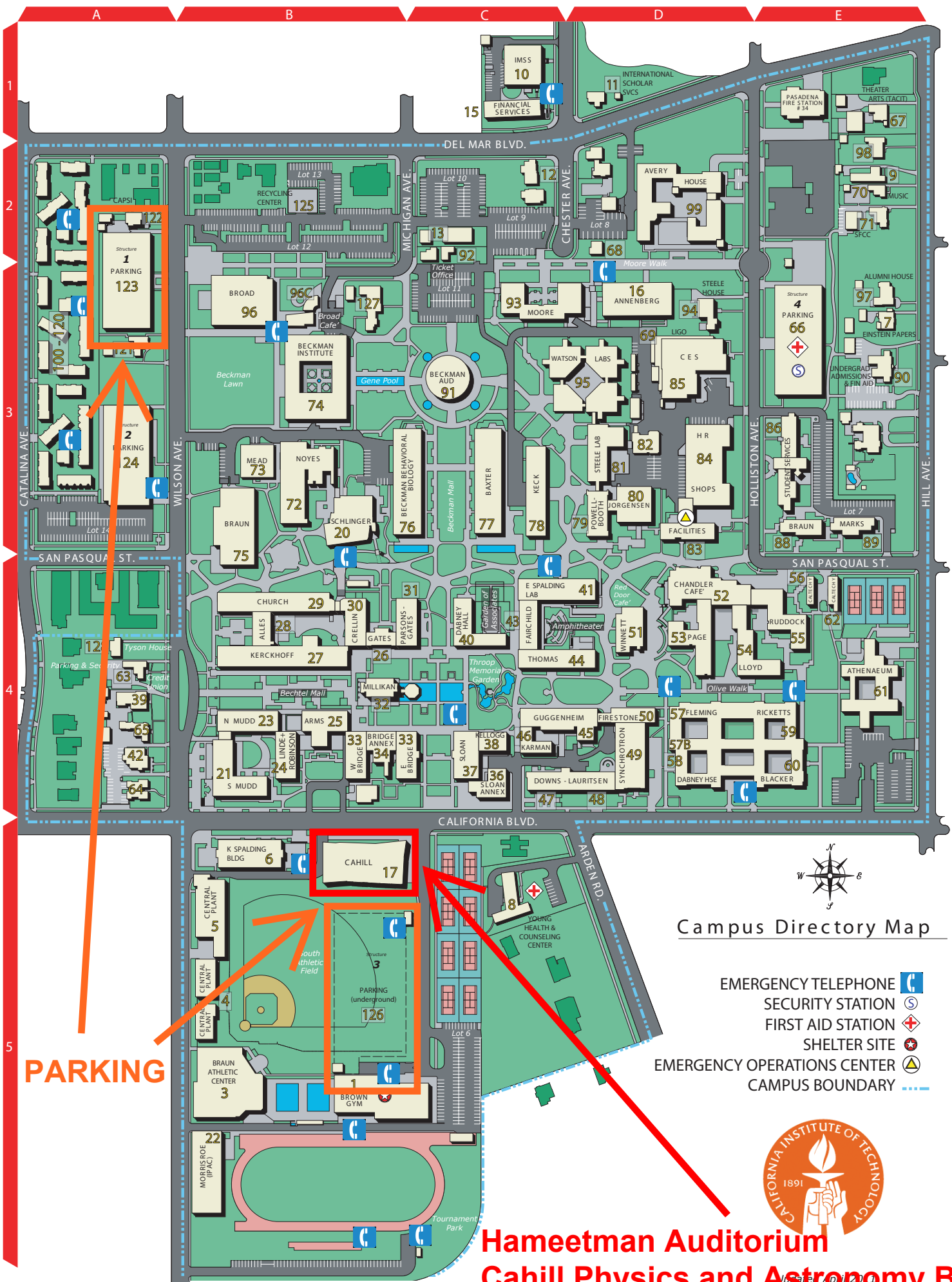
**The Johns Hopkins University  
APPLIED PHYSICS LABORATORY**



**NESC Academy**

<b>Start Time (PDT)</b>	<b>DAY 1 TOPIC (Monday October 22, 2012)</b>
0645	DOORS OPEN
0730	INTRODUCTORY STUFF
0745	GROUNDWORK FOR DISCUSSIONS
0755	FEEDBACK FROM MEETING 1
0805	SWOT HIGH POWER KLYSTRON HV DESIGN PART 1 (VORPERIAN & BOTVINNIK- JPL)
<b>0945</b>	<b>BREAK</b>
1000	SWOT HIGH POWER KLYSTRON HV DESIGN PART 2
<b>1100</b>	<b>QUESTIONS/DIALOGUE</b>
<b>1130</b>	<b>LUNCH</b>
1230	FAST HV MODULATOR DESIGN PART 1 (URDIALES- SWRI)
<b>1400</b>	<b>BREAK</b>
1415	FAST HV MODULATOR DESIGN PART 2
<b>1445</b>	<b>QUESTIONS/DIALOGUE</b>
1515	LOW POWER HV MODULATOR DESIGN-LITE (BATTEL)
<b>1625</b>	<b>QUESTIONS/DIALOGUE</b>
<b>1645</b>	<b>ADJOURN</b>
<b>1730</b>	<b>RECEPTION (VENUE IS TBD)</b>

<b>Start Time (PDT)</b>	<b>DAY 2 TOPIC (Tuesday October 23, 2012)</b>
0645	DOORS OPEN
0730	INTRODUCTORY STUFF
0740	CHEMIN HV DESIGN PART 1 (PEREZ & RUITBERG- JPL)
<b>0915</b>	<b>BREAK</b>
0945	CHEMIN HV DESIGN PART 2
1020	ALTERNATE CHEMIN HV DESIGN (BATTEL)
<b>1145</b>	<b>QUESTIONS/DIALOGUE (JOINT)</b>
<b>1200</b>	<b>LUNCH</b>
1300	MAVEN IUVS HV DESIGN (BATTEL)
<b>1445</b>	<b>BREAK- EARLY ADJOURN POINT</b>
1500	"USEFUL DESIGN NUGGETS" (BATTEL) - ION PUMP HV DESIGN - BULK HV SUPPLY DESIGN - PHOTOMULTIPLIER PS DESIGN - SILICON DETECTOR PS DESIGN - MARS HV SHIELDED DESIGN
<b>1415</b>	<b>QUESTIONS/DIALOGUE</b>
<b>1450</b>	<b>ADJOURN</b>



# CALIFORNIA INSTITUTE OF TECHNOLOGY

## Buildings by Name

Buildings by Name	Bldg No	Map Grid
1320 E San Pasqual (Caltech Y)	56	E4
1350 E San Pasqual (Caltech Y Annex)	62	E4
263 S Chester (International Scholar Services)	11	D1
275 S Hill (Theater Arts (TACIT))	67	E1
287 S Hill (Rickenbaugh House)	98	E1
293 S. Chester (Child Care Center)	12	C2-D2
295 S Hill	9	E2
305 S Hill (Music House)	70	E2
315 S Hill (SFCC)	71	E2
315 S Wilson (CAPSI-Educational Outreach)	122	A2
320 S Michigan (Campus Programs Annex)	13	C2
330 S Chester (Campus Programs Office)	68	D2
330 S Michigan Ave (Audio Visual Annex)	13A	C2
332 S Michigan (Campus Ticket Office)	92	C2
345 S Hill (Alumni House)	97	E2
345 S Michigan (Tolman-Bacher House)	127	B3
355 S Holliston (Steele House)	94	D3
363 S Hill (Einstein Papers House)	7	E3
375 S Wilson (Prufrock House)	121	A3
505 S Wilson (Tyson House)	128	A4
515 S Wilson (Credit Union/Parking/Security)	63	A4
525 S Wilson (U.S. Geological Survey)	39	A4
535 S Wilson (Fitzhugh House)	65	A4
551 S Wilson (Investment Office)	42	A4
565 S Wilson (Audit Svcs & Inst Compliance)	64	A4
Alles Laboratory	28	B4
Annenberg Ctr for Info Sci and Tech (IST)	16	D3
Arms Laboratory	25	B4
Athenaeum	61	E4
Avery House	99	D2
Baxter Hall	77	C3
Beckman Auditorium	91	C3
Beckman Behavioral Biology	76	B3-C3
Beckman Institute	74	B3
Blacker House	60	E4
Braun Athletic Center	3	B5
Braun House	88	E3
Braun Laboratories	75	B3
Bridge Annex	34	B4
Bridge Laboratory - East	33E	B4
Bridge Laboratory - West	33W	B4
Broad Café	96C	B3
Broad Center for the Biological Sciences	96	B3
Brown Gymnasium	1	B5
Cahill Ctr for Astrodscience and Astrophysics	17	B5
Catalina Graduate Housing	100-120	A2-A3
Central Engineering Services (CES)	85	D3
Central Plant	5	B5
Chandler Dining Hall (Chandler Café)	52	D4
Chem Storage (Solvent Storage)	30A	B4
Church Laboratory	29	B4
Cogeneration and Cooling Towers	4	B5
Crellin Laboratory	30	B4
Dabney Hall	40	D4
Dabney House	58	D4
Downs Laboratory	47	C4
Facilities/Facilities Management	83	D3
Financial Services	15	C1
Firestone Laboratory	50	D4
Fleming House	57	D4
Gates Annex	26	B4
Guggenheim Laboratory	45	C4
Human Resources/Facilities Management Shops	84	D3
Information Management Systems & Svcs (IMSS)	10	C1
Jorgensen Laboratory	80	D3
Karman Laboratory	46	C4
Keck Laboratories	78	C3
Kellogg Radiation Laboratory	38	C4
Kerckhoff Annex	27A	B4
Kerckhoff Laboratories	27	B4
Lauritsen Laboratory	48	D4
LIGO	69	D3
Linde+Robinson Laboratory	24	B4
Lloyd House	54	D4-E4
Marks House	89	E3
Mead Laboratory	73	B3
Millikan Library	32	B4
Moore Laboratory	93	C3
Morrisroe Astrodscience Laboratory (IPAC)	22	B5
Mudd Laboratories - North	23	B4
Mudd Laboratories - South	21	B4
Noyes Laboratory	72	B3
Page House	53	D4
Parking Structure 1 (South Wilson)	124	A3
Parking Structure 2 (Wilson Avenue)	123	A3
Parking Structure 3 (California Avenue)	126	B5
Parking Structure 4 (Holliston Avenue)	66	E3
Parsons-Gates Hall of Administration	31	B4
Powell-Booth Laboratory	79	D3
Recycling Center	125	B2
Ricketts House	59	E4
Ruddock House	55	E4
Satellite Utility Plant	66B	E3
Schlinger Lab for Chemistry and Chem Engr	20	B3
Sherman Fairchild Library	43	C4
Sloan Annex	36	C4
Sloan Laboratory	37	C4
South Undergrad Housing Complex Basement	57B	D4
Spalding, Eudora (Eudora Spalding Laboratory)	41	C4
Spalding, Keith (Keith Spalding Building)	6	B5
Steele Laboratory	81	D3
Student Activities Center	57B	D4
Student Services, Center for	86	E3
Synchrotron Laboratory	49	D4
Thomas Laboratory	44	C4
Transportation & Grounds Operations	82	D3
Undergraduate Admissions & Financial Aid	90	E3
Watson Laboratories	95	C3-D3
Winnett Center	51	D4
Young Health and Counseling Center	8	C5

## Functions & Places

Functions & Places	Bldg No or Map Grid
24-Hour Security	66
Administration	31
Admissions Office, Graduate	86
Admissions Office, Undergraduate	90
Alumni House	97
Amphitheater	C-4
Athletics (Indoors)	2-3
Athletics (Outdoors-South Athletic Fields)	B5-C5
Auditorium (Annenberg Auditorium)	16
Auditorium (Baxter Lecture Hall)	77
Auditorium (Beckman Auditorium)	91
Auditorium (Beckman Institute Auditorium)	74
Auditorium (Hameetman Auditorium)	17
Auditorium (Lees-Kubota Lecture Hall)	45
Auditorium (Norman Davidson Lecture Hall)	27
Auditorium (Ramo Auditorium)	77
Auditorium (Rock Auditorium)	96
Auditorium (Sharp Lecture Hall)	25
Auditorium (Sturdivant Lecture Hall)	72
Bechtel Mall	84
Beckman Lawn	83
Beckman Mall	C3
Bookstore	51
Caltech Credit Union (CEFCU)	63
Campus & Community Relations	32
Campus Programs Office	92
CAPSI (Caltech Precollege Science Initiative)	98
Card Services	51
Career Development Center	86
Corporate Relations	32
Development & Institute Relations	32
Diversity, Center for	86
Division Office (Biology)	27
Division Office (Chemistry & Chem Engineering)	30
Division Office (Engineering & Applied Science)	44
Division Office (Geological & Planetary Sciences)	25
Division Office (Humanities & Social Sciences)	77
Division Office (Physics, Math & Astronomy)	33
Employment	84
Facilities Management	83
Faculty Club (Athenaeum)	61
Faculty, Officers of the	96C
Fellowships and Study Abroad	86
Financial Aid	90
Food & Dining Services ( <i>Broad Café</i> )	96C
Food & Dining Services ( <i>Chandler Café</i> )	52
Food & Dining Services ( <i>Convenience Store</i> )	52
Food & Dining Services ( <i>Red Door Café</i> )	51
Garden of Associates	C4
Gene Pool (Fountain)	83
Governmental Relations	31
Graduate Office	86
Graphic Resources	6
Health Center	8
Human Resources	84
Humanities Reading Room	47
IMSS Help Desk	86
International Scholar Services	11
International Student Programs	86
Library (Astrophysics)	17
Library (Geology & Planetary Sciences)	23
Library (Humanities Reading Room)	40
Library (Millikan Library)	32
Library (Sherman Fairchild Library)	43
Marketing & Communications	32
Moore Walk	C2-D2
Olive Walk	D4-E4
Parking Office	63
Performing and Visual Arts	67/70
Post Office/Mail Services	6
Recreation	3
Registrar	86
Safety Office	63
Security Office	6
Staff & Faculty Consulting Center (SFCC)	71
Student Activities Center	57B
Student Services	86
Student-Faculty Programs	86
Tech Express	54
Theater Arts (TACIT)	67
Throop Memorial Gardens	C4
Ticket Office	92
Tournament Park	C5
Undergraduate Dean's Office	86
Young Health & Counseling Center	8

## Buildings by Number

Buildings by Number	Map Grid
1 Brown Gymnasium	B5
3 Braun Athletic Center	B5
4 Cogeneration and Cooling Towers	B5
5 Central Plant	B5
6 Spalding, Keith (Keith Spalding Building)	B5
7 363 S Hill (Einstein Papers House)	E3
8 Young Health and Counseling Center	C5
9 295 S Hill	E2
10 Information Management Systems & Svcs (IMSS)	C1
11 266 S Chester (International Scholar Svcs)	D1
12 293 S Chester (Child Care Center)	C2-D2
13 320 S Michigan (Campus Programs Annex)	C2
13A 330 S Michigan (Audio Visual Annex)	C2
15 Financial Services	C1
16 Annenberg Ctr for Info Sci and Tech (IST)	D3
17 Cahill Ctr for Astrodscience and Astrophysics	B5
20 Schlinger Lab for Chem and Chemical Engr	B3
21 Mudd Laboratories - South	B4
22 Morrisroe Astrodscience Laboratory (IPAC)	B5
23 Mudd Laboratories - North	B4
24 Linde+Robinson Laboratory	B4
25 Arms Laboratory	B4
26 Gates Annex	B4
27 Kerckhoff Laboratories	B4
27A Kerckhoff Annex	B4
28 Alles Laboratory	B4
29 Church Laboratory	B4
30 Crellin Laboratory	B4
30A Chem Storage (Solvent Storage)	B4
31 Parsons-Gates Hall of Administration	B4
32 Millikan Library	B4
33E Bridge Laboratory - East	B4
33W Bridge Laboratory - West	B4
34 Bridge Annex	B4
36 Sloan Annex	C4
37 Sloan Laboratory	C4
38 Kellogg Radiation Laboratory	C4
39 525 S Wilson (US Geological Survey)	A4
40 Dabney Hall	D4
41 Spalding, Eudora (Eudora Spalding Laboratory)	C4
42 551 S Wilson (Investment Office)	A4
43 Sherman Fairchild Library	C4
44 Thomas Laboratory	C4
45 Guggenheim Laboratory	C4
46 Karman Laboratory	C4
47 Downs Laboratory	C4
48 Lauritsen Laboratory	D4
49 Synchrotron Laboratory	D4
50 Firestone Laboratory	D4
51 Winnett Center	D4
52 Chandler Dining Hall (Chandler Café)	D4
53 Page House	D4
54 Lloyd House	D4-E4
55 Ruddock House	E4
56 1320 E San Pasqual (Caltech Y)	E4
57 Fleming House	D4
57B South Undergrad Housing Complex Basement	D4
Student Activities Center	D4
58 Dabney House	D4
59 Ricketts House	E4
60 Blacker House	E4
61 Athenaeum	E4
62 1350 E San Pasqual (Caltech Y Annex)	E4
63 515 S Wilson (Credit Union/Parking/Security)	A4
64 565 S Wilson (Audit Svcs & Inst Compliance)	A4
65 535 S Wilson (Fitzhugh House)	A4
66 Parking Structure 4 (Holliston Avenue)	E3
66B Satellite Utility Plant	E3
67 275 S Hill (Theater Arts (TACIT))	E1
68 330 S Chester (Campus Programs Office)	D2
69 LIGO	D3
70 305 S Hill (Music House)	E2
71 315 S Hill (SFCC)	E2
72 Noyes Laboratory	B3
73 Mead Laboratory	B3
74 Beckman Institute	B3
75 Braun Laboratories	B3
76 Beckman Behavioral Biology	B3-C3
77 Baxter Hall	C3
78 Keck Laboratories	C3
79 Powell-Booth Laboratory	D3
80 Jorgensen Laboratory	D3
81 Steele Laboratory	D3
82 Transportation & Grounds Operations	D3
83 Facilities/Facilities Management	D3
84 Human Resources/Facilities Management Shops	D3
85 Central Engineering Services (CES)	D3
86 Center for Student Services	E3
88 Braun House	E3
89 Marks House	E3
90 383 S Hill (Undergrad Admis & Financial Aid)	E3
91 Beckman Auditorium	C3
92 332 S Michigan (Campus Ticket Office)	C2
93 Moore Laboratory	C3
94 355 S Holliston (Steele House)	D3
95 Watson Laboratories	C3-D3
96 Broad Center for the Biological Sciences	B3
96C Broad Café	B3
97 345 S Hill (Alumni House)	E2
98 287 S Hill (Rickenbaugh House)	E1
99 Avery House	D2
100-120 Catalina Graduate Housing	A2-A3
121 375 S Wilson (Prufrock House)	A3
122 315 S Wilson (CAPSI-Educational Outreach)	A2
123 Parking Structure 2 (Wilson Avenue)	A3
124 Parking Structure 1 (South Wilson)	A3
125 Recycling Center	B2
126 Parking Structure 3 (California Avenue)	B5
127 345 S Michigan (Tolman-Bacher House)	B3
128 505 S. Wilson (Tyson House)	A4



# 2012 High Voltage Power Supply Design Workshop

October 22-23, 2012

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## HOTEL ACCOMODATIONS

### Hotels/Motels in walking distance of campus:

#### Vagabond Inn

1203 E. Colorado Blvd.  
Pasadena, CA 91106  
(626) 449-3170

#### Saga Motor Hotel

1633 E. Colorado Blvd.  
Pasadena, CA 91106  
(626) 795-0431

### Hotels near Old Town Pasadena (2-5 miles from campus):

#### Courtyard by Marriott *(ask for Caltech rate)*

180 N. Fair Oaks Ave  
Pasadena, CA 91103  
(626) 403-7600

#### Hilton Pasadena *(shuttle service to campus, ask for Caltech rate)*

168 S. Los Robles Ave.  
Pasadena, CA 91101  
(626) 577-1000

#### Sheraton Pasadena Hotel *(shuttle service to campus, ask for Caltech rate)*

303 E. Cordova St.  
Pasadena, CA 91101  
(626) 449-4000

#### The Westin Pasadena *(shuttle service to campus, ask for Caltech rate)*

191 N. Los Robles Ave.  
Pasadena, CA 91101  
(626) 304-1444



**Hotels within a short distance to Caltech (2-3 miles):**

**Best Western Pasadena Inn**

3570 E. Colorado Blvd.  
Pasadena, CA 91107  
(626) 796-9100

**Best Western Pasadena Royale**

3600 E. Colorado Blvd.  
Pasadena, CA 91107  
(626) 793-0950

**Comfort Inn**

2462 E. Colorado Blvd.  
Pasadena, CA 91107  
(626) 405-0811

**Holiday Inn Express**

3500 E. Colorado Blvd.  
Pasadena, CA 91107  
(626) 792-9213

**Ramada Pasadena**

2156 E. Colorado Blvd.  
Pasadena, CA 91107  
(888) 551-5543

**The Langham Huntington Hotel and Spa** (*shuttle service to campus, ask for Caltech rate*)

1401 S. Oak Knoll Ave.  
Pasadena, CA 91106  
(626) 568-3900

**Hotels within the greater Pasadena area:**

**Arroyo Vista Inn Bed and Breakfast** (*ask for Caltech rate*)

335 Monterey Road  
South Pasadena, CA 91030  
(888) 927-7696/(323) 478-7300

**Comfort Inn, Eagle Rock** (*Caltech rate*)

2300 West Colorado Blvd.  
Los Angeles, CA 90041  
(323) 256-1199

**Doubletree Hotel, Monrovia-Pasadena** (*shuttle service to campus, ask for Caltech rate*)

924 West Huntington Drive  
Monrovia, CA 91016  
(626) 357-1900

**Embassy Suites Hotel, Arcadia** *(ask for Caltech rate)*

211 E. Huntington Drive  
Arcadia, CA 91006  
(626) 445-8525

**Residence Inn by Marriott, Arcadia-Pasadena**

321 E. Huntington Drive  
Arcadia, CA 91006  
(626) 446-6500

**Spring Hill Suites Pasadena Arcadia**

Spring Hills Suites, Arcadia  
99 North 2nd Avenue  
Arcadia, California 91006 USA  
(626) 821-5400

**Hampton Inn, Arcadia**

311 East Huntington Drive  
Arcadia, California 91006 USA  
(626) 574-5600

**Hilton Garden Inn, Arcadia**

199 North 2nd Avenue  
Arcadia, California 91006 USA  
(626) 574-6900

**Extended Stay America, Arcadia**

401 East Santa Clara Street  
Arcadia, California 91006 USA  
(626) 446-6422

**Santa Anita Inn, Arcadia**

130 West Huntington Drive  
Arcadia, California 91006 USA  
(626) 446-5211

# GETTING DIRECTIONS TO THE CALTECH CAMPUS

## From Los Angeles International Airport:

**Driving Directions:** Take Sepulveda Blvd. south to the Glenn Anderson Fwy (105) east to the Harbor Fwy (110) north to the Pasadena Fwy, which becomes the Arroyo Parkway.

*Or:*

Take the San Diego Fwy (405) north to the Santa Monica Fwy (10) east to the Harbor Fwy (110) north to the Pasadena Fwy, which becomes the Arroyo Parkway.

*Then:*

Take the Arroyo Parkway straight ahead (north); turn right (east) on California Blvd. Proceed approximately one and a quarter miles. The Caltech campus will be on your left. Turn left (north) at Hill Ave. Turn left (west) at San Pasqual St. Turn right (north) onto Holliston Ave. Proceed to the Holliston Parking Structure on your right at 370 S. Holliston Ave. (Building #66 on the campus map) to register your car and receive instructions on where to park.

**Shuttle service:** To get a shuttle, exit the baggage claim area and look for the ORANGE overhead "SHARED RIDE VANS" sign. Tell the driver you are going to Caltech; if you are asked for an address or intersection, Holliston Ave. and Del Mar Blvd. is near the southeast corner of campus (see the campus map for other streets).

## From the Bob Hope Airport (Burbank):

**Driving Directions:** Take the Golden State Fwy (Interstate 5) south to the Ventura Fwy (134) east to the Foothill Fwy (210) east. Exit at Hill Avenue. Turn right (south) onto Hill. Take Hill south to San Pasqual St. and make a right (west). Turn right (north) onto Holliston Ave.

**Shuttle service:** Tell the driver you are going to Caltech; if you are asked for an address or intersection, Holliston Ave. and Del Mar Blvd. is near the southeast corner of campus (see the campus map for other streets).

## From Ontario Airport:

**Driving Directions:** Take the San Bernardino Fwy (10) west to Orange Freeway (57) north to the Foothill Fwy (210); take the 210 west to Pasadena. Exit at Hill Ave; turn left (south) on Hill. Take Hill south to San Pasqual St. and make a right (west). Turn right (north) onto Holliston Ave.

**Shuttle service:** Tell the driver you are going to Caltech; if you are asked for an address or intersection, Holliston Ave. and Del Mar Blvd. is near the southeast corner of campus (see the campus map for other streets).



## **Driving Directions:**

Caltech is easily accessible from both the 110 (Harbor) Freeway (southwest of campus) and the 210 (Foothill) Freeway (north of campus).

If you're taking the 110 freeway, follow the freeway north until it ends (where it becomes the Arroyo Parkway). Take the Arroyo Parkway straight ahead (north); turn right (east) on California Blvd. Proceed approximately one and a quarter miles. The Caltech campus will be on your left-hand side. Turn left (north) at Hill Ave. Turn left (west) at San Pasqual St. Turn right (north) onto Holliston Ave. Proceed to the Holliston Parking Structure on your right at 370 S. Holliston Ave. (Building #66 on the campus map) to register your car.

If you're taking the 210 freeway, exit at Hill Avenue; turn south on Hill. Take Hill south to San Pasqual St. and make a right (west). Turn right (north) onto Holliston Ave.

## **By Public Transportation:**

### ***Transportation Options***

Visit our [transit guide link](#). The transit guide site is intended especially for the Caltech community. You will find Caltech-specific information on everything from transit subsidies to bus routes to make your trip cheaper and faster on public transit

**Downtown Los Angeles to Pasadena:** The MTA 401 Express bus can be boarded on Spring Street in downtown Los Angeles, approximately three blocks west of Union Station. Exit in Pasadena at Colorado and Wilson; Caltech is approximately three blocks south.

The MTA 485 bus boards at the Busway off of Alameda, in front of Union Station. Exit at Lake and California in Pasadena and walk east to Caltech.

**Caltech to JPL:** Board the westbound MTA 177 bus on California Blvd. Discounted monthly and weekly bus passes, as well as student passes, are available through both Foothill Transit and MTA. Bus and transit maps are not available in bookshops or other local businesses, but may be picked up at the Patsaouras Transit Plaza (behind Union Station) in Los Angeles or in the Keith Spalding Building on the Caltech campus.

### ***Bus and Rail Trip Planner***

Detailed bus and rail itineraries for the entire Los Angeles area, including Pasadena, can be planned on the [TranStar](#) website.